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ROCKY MOUNTAIN FOREST AND RANGE EXPERIMENT STATION

Accuracy of Determining Mountain Pine Beetle Attacks in Ponderosa Pine Utilizing Pitch Tubes, Frass, and Entrance Holes

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Counts of external indicators of attacks by the mountain pine beetle, *Dendroctonus ponderosae* Hopkins, throughout the infested length of five sampled ponderosa pines, were 1.5 percent greater than actual attacks.

Keywords: *Dendroctonus ponderosae*, *Pinus ponderosa*.

Bark beetle studies often require information about individual attacks on infested trees. It is useful to be able to identify attacks soon after they are made, using pitch tubes, frass exudations, and entrance holes as indicators. Many investigators have done this. Miller and Keen (1960) report using paper tags in marking attacks of *Dendroctonus brevicomis* Hopkins, and McCambridge (1967) marked individual attacks of *D. ponderosae* Hopkins with nails. Some attacks may not be readily seen, however, even with careful inspection.

To test the relationship between actual attacks and those indicated by these external signs, I marked attack points of *D. ponderosae* on *Pinus ponderosa* Lawson in the summer of 1971, and subsequently debarked the infested trees and counted egg galleries.

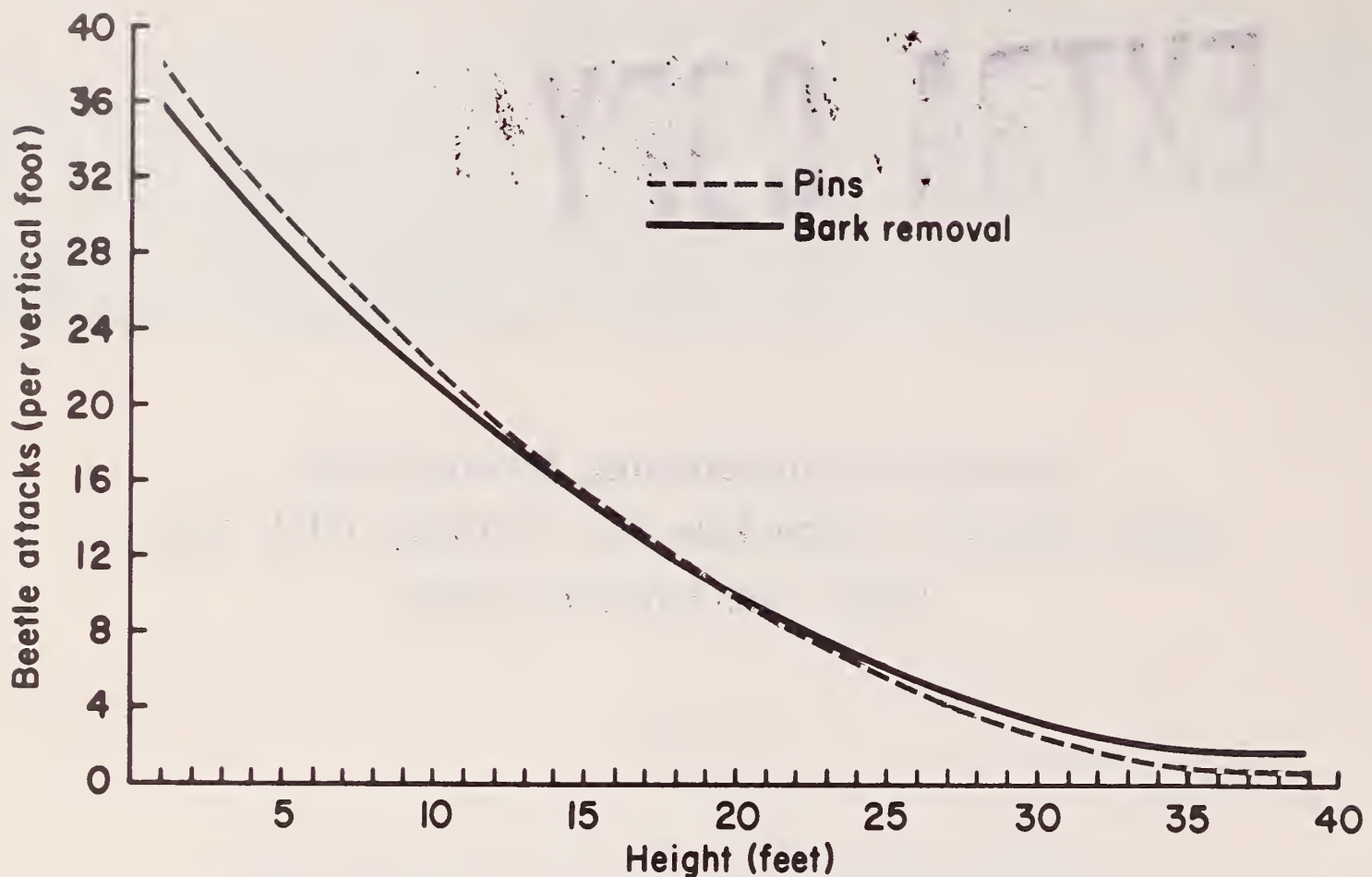
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Methods

Two sites were selected in July 1971 on the Roosevelt National Forest, about 35 miles northwest of Fort Collins, Colorado. One artificially infested bolt was set out at each site to attract beetles. The first three trees attacked at one site and the first two at the other site were selected for study.

A thin band of aluminum paint was sprayed around the circumference of each tree at 1-foot intervals up to a 4-inch diameter to facilitate recording attacks. Individual beetle attacks as indicated by pitch tubes, frass, or entrance holes were marked on August 9-13, 17-20, 23, 26, 30 and September 7. Pins were inserted below each presumed attack location.

All trees were felled, bucked into 5-foot sections, and taken to the laboratory when the attack period was over. In the laboratory, the sections were debarked and all beetle attacks were checked against the pin counts.



Results

The number of attacks tallied by external indicators was strongly correlated ($r = 0.996$) with those found on the inner surface of the bark (fig. 1). Counts of external indicators differed from actual attacks by approximately ± 2.4 attacks for each foot interval throughout the height of the infested trees. There was a tendency to overcount attacks near the ground, and undercount those high in the tree.

There were 1.5 percent more external indicators than actual attacks (fig. 1). Actual attack counts did not always agree with external counts because: (1) Sap exuding from the entrance holes enveloped some pins, so that some attacks were tallied more than once, (2) bark scales concealed some attacks in the upper portions of the trees, (3) in the upper portions of the trees, sap exudation and/or frass was frequently absent so that many attacks beneath the bark scales were not readily found, (4) mountain pine beetle and *Ips* attacks were indistinguishable (during this study *Ips* beetles were not numerous, however), and (5) thick bark near the ground contributed to a higher pin count in this part of the tree because frass from a single attack would accumulate in more than one place.

Figure 1.—Mountain pine beetle attacks as determined from bark removal (actual) and pin counts—mean of five trees.

With the exception that large *Ips* populations would seriously influence attack counts, most of the sampling errors are compensating. Therefore, counting external indicators offers an acceptably accurate, nondestructive method of measuring the intensity and distribution of mountain pine beetle attacks on standing trees.

Literature Cited

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